Claims

[c1]   1. An optical substrate comprising:

a surface comprising a prism structure characterized by a cross section having a curved facet described by the equation

$$z = \frac{cr^2}{1+\sqrt{1-(1+k)c^2r^2}} + dr^2 + er^4 + fr^6,$$

wherein z is the perpendicular deviation of the surface of the facet of the prism from a straight line originating at a first reference point at a base of the prism and terminating at a second reference point near the peak of the prism and the coefficients of the polynomial lie within the following approximate ranges: $-20 < c < 20$; $-10 < d < 10$; $-10 < e < 10$; $-10 < f < 10$ and $-1 < k$ is less than or equal to zero and where r is a radial coordinate or distance from an optical axis.

[c2]   2. The optical substrate as set forth in Claim 1 wherein the prism structure comprises a plurality of prisms having a prescribed peak angle, α, a height, h, a length, l, and a pitch, p.

[c3]   3. The optical substrate as set forth in Claim 2 wherein the plurality of prisms include at least a pseudorandom peak angle, α, height, h, length, l, and pitch, p.

[c4]   4. The optical substrate as set forth in Claim 1 wherein a peak angle of the prism is greater than 90 degrees and the refractive index of the substrate is between approximately 1.65 and 1.8.

[c5]   5. The optical substrate as set forth in Claim 4 wherein the peak angle is 100 degrees.

[c6]   6. An optical substrate comprising:

a surface comprising a prism structure characterized by a peak angle of greater than 90 degrees and a refractive index of between approximately 1.65 and 1.8.

[c7]   7. The optical substrate as set forth in Claim 6 wherein the peak angle is 100 degrees.

[c8]

     8. A backlight display device comprising:

an optical source for generating light;

a light guide for guiding the light therealong including a reflective device positioned along the light guide for reflecting the light out of the light guide;

an optical substrate receptive of the light from the reflective device, the optical substrate comprising:
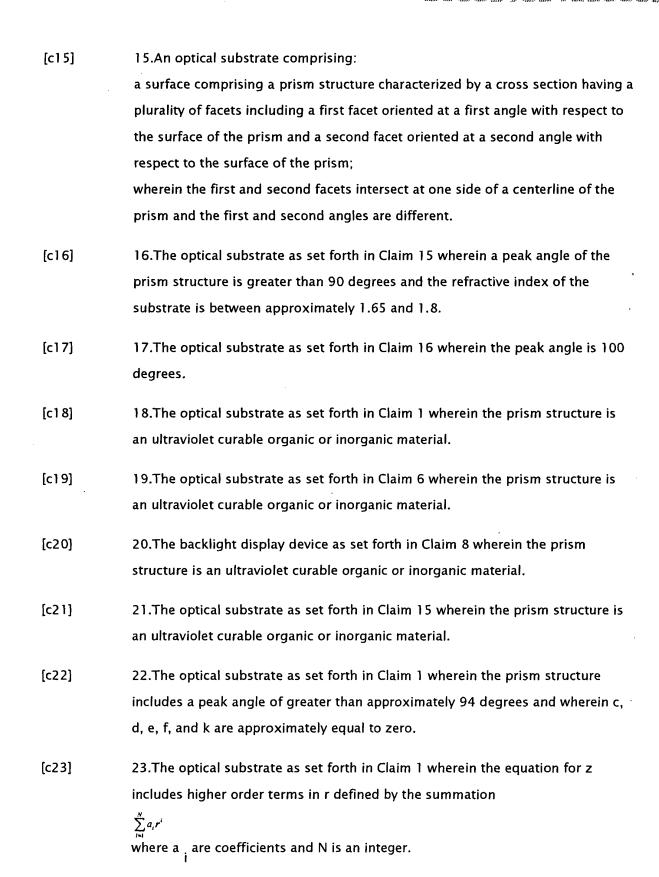
a surface comprising a prism structure characterized by a cross section having a curved facet.

[c9]   9.The backlight display device as set forth in Claim 8 wherein the curved facet is described by a segment of a polynomial function.

[c10]   10.The backlight display device as set forth in Claim 8 wherein the segment of the polynomial function is described by the equation

$$z = \frac{cr^2}{1+\sqrt{1-(1+k)c^2r^2}} + dr^2 + er^4 + fr^6,$$

wherein z is the perpendicular deviation of the surface of the facet of the prism from a straight line originating at a first reference point at a base of the prism and terminating at a second reference point near the peak of the prism and the coefficients of the polynomial lie within the following approximate ranges: $-20 < c < 20$; $-10 < d < 10$; $-10 < e < 10$; $-10 < f < 10$ and $-1 < k$ is less than or equal to zero and where r is a radial coordinate or distance from an optical axis.

[c11]   11.The backlight display device as set forth in Claim 8 wherein a peak angle of the prism is greater than 90 degrees and the refractive index of the substrate is between approximately 1.65 and 1.8.

[c12]   12.The backlight display device as set forth in Claim 11 wherein the peak angle is 100 degrees.

[c13]   13.The backlight display device as set forth in Claim 8 wherein the optical substrate is formed with an optically transparent material with an index of refraction between approximately 1.65 and 1.8.

[c14]   14.The backlight display device as set forth in Claim 10 wherein the optical substrate is formed with an optically transparent material with an index of refraction of approximately 1.75.

[c15]   15. An optical substrate comprising:

a surface comprising a prism structure characterized by a cross section having a plurality of facets including a first facet oriented at a first angle with respect to the surface of the prism and a second facet oriented at a second angle with respect to the surface of the prism;

wherein the first and second facets intersect at one side of a centerline of the prism and the first and second angles are different.

[c16]   16. The optical substrate as set forth in Claim 15 wherein a peak angle of the prism structure is greater than 90 degrees and the refractive index of the substrate is between approximately 1.65 and 1.8.

[c17]   17. The optical substrate as set forth in Claim 16 wherein the peak angle is 100 degrees.

[c18]   18. The optical substrate as set forth in Claim 1 wherein the prism structure is an ultraviolet curable organic or inorganic material.

[c19]   19. The optical substrate as set forth in Claim 6 wherein the prism structure is an ultraviolet curable organic or inorganic material.

[c20]   20. The backlight display device as set forth in Claim 8 wherein the prism structure is an ultraviolet curable organic or inorganic material.

[c21]   21. The optical substrate as set forth in Claim 15 wherein the prism structure is an ultraviolet curable organic or inorganic material.

[c22]   22. The optical substrate as set forth in Claim 1 wherein the prism structure includes a peak angle of greater than approximately 94 degrees and wherein c, d, e, f, and k are approximately equal to zero.

[c23]   23. The optical substrate as set forth in Claim 1 wherein the equation for z includes higher order terms in r defined by the summation

$$\sum_{i=1}^{N} a_i r^i$$

where a_i are coefficients and N is an integer.

[c24]
           24. The optical substrate as set forth in Claim 10 wherein the prism structure

includes a peak angle of greater than approximately 94 degrees and wherein c, d, e, f, and k are approximately equal to zero.

[c25]   25. The optical substrate as set forth in Claim 10 wherein the equation for z includes higher order terms in r defined by the summation

$$\sum_{i=1}^{N} a_i r^i$$

where a_i are coefficients and N is an integer.

[c26]   26. An optical substrate comprising:

a surface comprising a prism structure characterized by a cross section having a facet described by the equation

$$z = \frac{cr^2}{1 + \sqrt{1 - (1+k)c^2 r^2}},$$

wherein z is the perpendicular deviation of the surface of the facet of the prism from a straight line originating at a first reference point at a base of the prism and terminating at a second reference point near the peak of the prism.

[c27]   27. The optical substrate as set forth in Claim 26 wherein the equation further comprises thea summation of higher order terms

$$+ dr^2 + er^4 + fr^6$$

wherein the coefficients thereof lie within the following approximate ranges: –20 < c < 20; –10 < d < 10; –10 < e < 10; –10 < f < 10 and –1 < k is less than or equal to zero and where r is a radial coordinate or distance from an optical axis.

[c28]   28. An optical substrate comprising:

a surface comprising a prism structure characterized by a cross section having a plurality of facets intersecting at a peak so as to subtend a peak angle of α.

[c29]   29. The optical substrate as set forth in Claim 28 wherein the plurality of facets form one or more compound facets respectively subtending an angle of β or θ with a base of the prism.